Peripheral facial nerve palsy in children during the COVID-19 pandemic

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Objectives. During the COVID-19 pandemic, an increased frequency of peripheral facial nerve palsy has been described in adults and children. The etiology of the disease during this time remains unclear, since most cases occurred in patients who tested negative for SARS-CoV-2 infection.

Patients and methods. Retrospective study of pediatric cases of facial nerve palsy treated during the first year of the pandemic in the emergency department of a children´s hospital located in one of the areas with the highest prevalence of COVID-19 in Spain. Data from this period are compared with cases from the previous three years.

Results. Twenty-nine patients with Bell's palsy were included. Over the previous three years combined, 24 patients presented with the same condition, a more than threefold increase. No clinical differences were found between the groups apart from the fact that fewer patients received corticosteroids during the pandemic (13.8% vs 41.6%; $p = 0.022$). Fourteen children underwent microbiologic testing for active SARS-CoV-2 infection (12 polymerase chain reaction, two rapid antigen test); all were negative. Thirteen patients received serologic testing, two with a positive IgG (15.3%).

Conclusion. A substantial increase in hospital presentations for facial nerve palsy was observed among children and adolescents during the first year of the pandemic, though findings of microbiologic testing cannot confirm a direct link with SARS-CoV-2 infection in most cases. Patient characteristics did not change between the two time periods. Difficulty accessing primary-care facilities during the pandemic in Spain may have played a role in this increase.

Key words. Bell´s palsy. COVID-19. Emergency medicine. Pediatric neurology. Peripheral facial nerve palsy. SARS-CoV-2.

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Introduction

Peripheral facial nerve palsy (FNP) is an uncommon cause of emergency department (ED) visits in childhood. The most common cause of FNP is idiopathic (Bell's palsy). Other relevant etiologies include systemic viral infections, complicated otitis media, trauma, hypertension, or malignancies [1].

Since the beginning of the coronavirus disease 2019 (COVID-19) pandemic in March 2020, individual cases of peripheral FNP associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection have been described in adults and children [2]. Several subsequent reports have found an increased worldwide frequency of FNP in both populations [3,4]. However, the etiology remains unclear, since most cases have occurred in patients who are negative for SARS-CoV-2 infection [5,6].

The present study aims to analyze the clinical and epidemiological characteristics of children presenting to the ED with FNP during the first year of the COVID-19 pandemic, comparing these results against those from the three previous years.

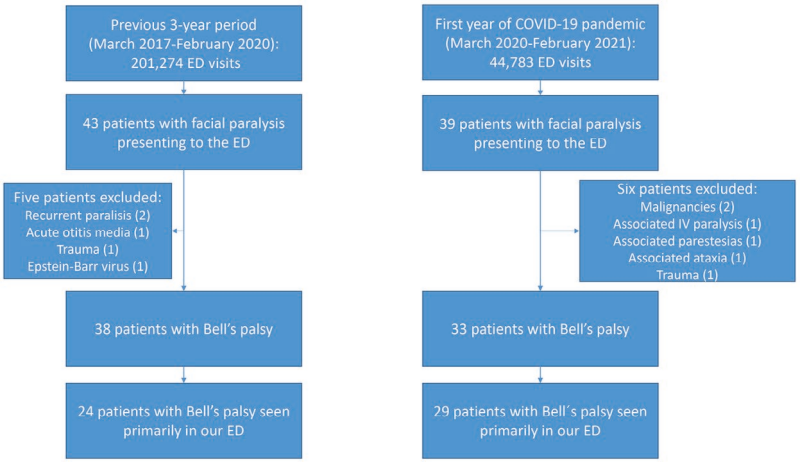
Patients and methods

A retrospective study was conducted of children and adolescents (age ≤ 18 years) presenting to the ED with peripheral FNP between March 1st, 2020, and February 28th, 2021. The facility, a children's hospital in Madrid, is located in an area with one of the highest rates of COVID-19 prevalence in Spain [7].

Bell's palsy was defined as idiopathic, acute peripheral-nerve FNP of the lower motor neuron leading to unilateral facial weaknessx with no other neurologic abnormalities on examination. We included patients with an undetermined cause after clinical history, physical examination, laboratory testing, and, where appropriate, imaging studies.

Patients meeting the following criteria were excluded:

Figure 1. Patients included.



- Other neurologic abnormalities on examination;
- Known cause of paralysis: systemic viral infections, trauma, acute otitis media, malignancies;
- Recurrent paralysis (two or more previous episodes of FNP).

We recorded age, sex, history of previous diseases, side of facial involvement, House-Brackmann grade, other neurological symptoms, systemic symptoms, imaging tests performed, treatments prescribed, and return visits (unplanned emergency visit for the same diagnosis within 72 hours of ED discharge). Microbiologic analyses of SARS-CoV-2 infection were also recorded: polymerase chain reaction (PCR) and rapid antigen test (RAT) from nasopharyngeal swabs and ELISA-based serological tests for immunoglobulin G. A control group was included, comprising patients diagnosed with peripheral FNP over the previous three years (March 1, 2017, to February 28, 2020).

Data were analyzed using Stata version 15.0 (StataCorp). Normally distributed variables were reported as mean and standard deviation. Variables that did not meet the normality requirements were reported as median and interquartile range. Variables within categories were expressed as percentages. Two-tailed *t* tests were used to compare means between groups. Chi-squared tests were used to compare proportions. p values < 0.05 were considered statistically significant.

We compared the year-long occurrence of peripheral FNP against the course of the pandemic in the Madrid region. To describe the course of the pandemic, we chose weekly COVID-19 hospital admissions rather than weekly new COVID-19 cases, because during the first months of the pandemic, PCR availability was restricted to severe cases, thus thwarting efforts to determine the real incidence. Data were obtained from daily reports issued by the health authorities [7].

Approval from the institutional ethics committee was obtained.

Results

The study sample is summarized in figure 1. Twenty-nine patients with Bell's palsy were seen primarily in ED of the Niño Jesús Children's Hospital in Madrid, Spain, during the first year of the pandemic. Over the previous three years, a total of 24 patients presented with the same condition, representing a more than threefold increase during the pandemic.

Epidemiological and clinical characteristics of patients included in both groups are summarized in table. No inter-group differences were found regarding age, sex, previous diseases, side of involvement, or House-Brackmann grade. During the pandemic, fewer patients received corticosteroids compared to the control group (13.8% vs 41.6%; p = 0.022).

Fourteen patients underwent microbiological testing to detect active SARS-CoV-2 infection (12 patients with PCR, two with RAT); all were negative. Serological evaluation was performed in 13 patients, 2 of whom had positive IgG against SARS-CoV-2.

The number of ED visits due to Bell's palsy throughout the pandemic and its relationship with weekly COVID-19 admissions in the Madrid region are explained in figure 2. Monthly cases of FNP over the four years studied are described in figure 3.

Discussion

Neurological symptoms secondary to SARS-CoV-2 infection, which have been predominantly reported in adults, also occur children. Sandoval et al reported that 14.4% of children admitted with confirmed infection presented new-onset neurologic symptoms ranging from mild (headache, muscle weakness, anosmia, ageusia) to severe (epileptic status, Guillain-Barré syndrome, encephalopathy,

demyelinating events) [8]. SARS-CoV-2 infection can cause neurologic symptoms due to different mechanisms. One is the result of direct invasion of the central nervous system by disruption of the blood-brain barrier or trans-synaptic spread from the respiratory system [9]. It seems, however, that peripheral nervous system involvement (as in cases of Guillain-Barré syndrome or isolated neuropathies) is secondary to autoimmune mechanisms [10], suggesting that facial nerve involvement could be immunomodulated, which makes it difficult to demonstrate the causality of SARS-CoV-2 infection since symptoms appear when the patient is already clear of infection and has developed antibodies against the virus. This could explain the fact that none of the patients in our series had a confirmed active infection.

Nevertheless, only two of the 13 children who underwent serological testing (15.3%) showed previous SARS-CoV-2 infection. Here we must highlight that seroprevalence was as high as 11.3% in the Madrid region as of June 2020 [7]. Although Islamoglu *et al.* reported positive SARS-CoV-2 serology testing in 24.3% of the adult patients with Bell's palsy in their series, which is higher than the seroprevalence studies conducted in asymptomatic individuals, most patients remained negative [6].

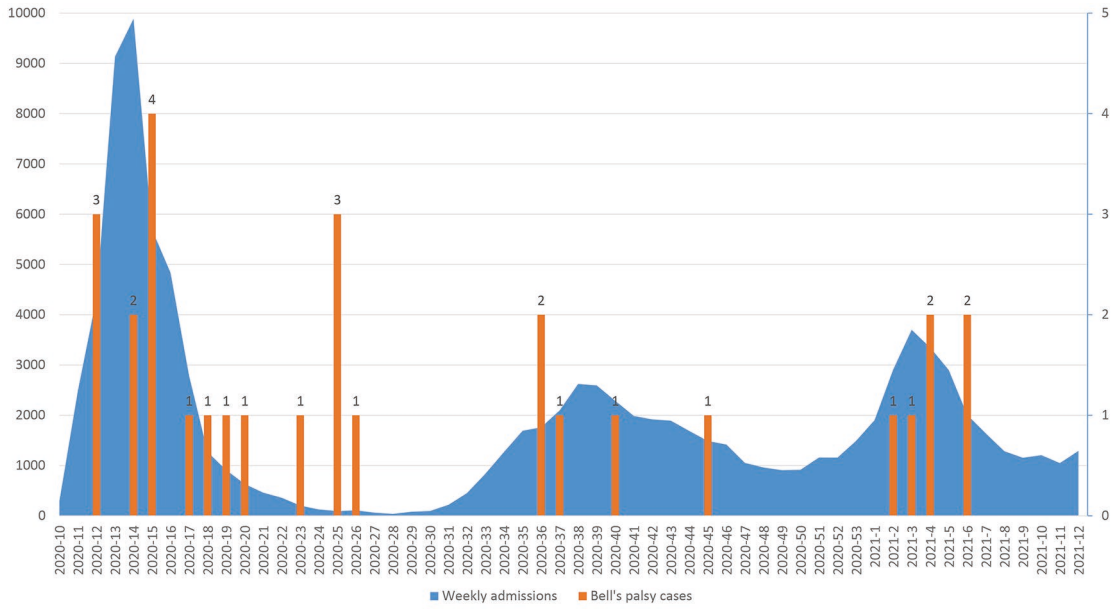
FNP is a clinical syndrome of remarkably diverse etiology. Both during the pandemic and before, the etiology reported in our series resembles that of previous publications, with the largest group being idiopathic. Most cases are classified as Bell's palsy due to the lack of a confirmed etiology [1]. Although different causative viruses have been related to FNP, due to the benign outcomes associated with this condition, an extended laboratory workup is not performed routinely in our ED, so we cannot rule out the possibility that another virus produced FNP. There are very few published cases of peripheral FNP related to COVID-19 in otherwise healthy pediatric patients [2]. Although the relationship between COVID-19 and alterations in both the central and peripheral nervous system has been extensively described, our series presents similar findings to articles evidencing an increased ED caseload despite negative or unavailable microbiologic test results [4]. Thus, the low number of positive SARS-CoV-2 PCR tests may even have been found incidentally in Bell's palsy patients, as proposed in adults [5].

We also found no differences in ED visits by FNP cases during and before the pandemic, apart from the fact that corticosteroids were used less frequently in pandemic times due to the lack of large, randomized, controlled, prospective studies supporting their use in pediatric patients [1]. This recommendation against corticosteroid use in patients under 16 years of age is included in the clinical-practice protocol of our institution, approved

Table. Characteristics of patients with idiopathic peripheral facial nerve palsy presenting to the emergency department.

	Pandemic (*n* = 29)	Control group (*n* = 24)	*p* value
Age (years), median (interquartile range)	10.4 (7.6-12.4)	9.6 (5.3-13.3)	0.64
Sex, *n* (%)			
Male	12 (41.4)	9 (37.5)	0.77
Female	17 (58.6)	15 (62.5)	
Underlying medical condition, *n* (%)	0	0	
Duration of symptoms (days) before ED presentation, median (interquartile range)	1 (1-3)	1 (1-2)	0.12
Site of involvement, *n* (%)			
Right	11 (37.9)	11 (45.8)	0.56
Left	18 (52.1)	13 (54.2)	
House-Brackmann scale, *n* (%)			
2	6 (20.7)	2 (8.3)	
3	20 (69)	18 (75)	0.44
4	0	1 (4.2)	
Unknown	3 (10.3)	3 (12.5)	
Corticosteroids, *n* (%)			
Yes	4 (13.7)	10 (41.6)	**0.022**
No	25 (86.2)	14 (58.3)	
TCT scan, *n* (%)			
Yes	0	1 (4.1)	0.26
No	29 (100)	23 (95.9)	
Return visit, *n* (%)			
Yes	2 (6.9)	3 (12.5)	0.48
No	27 (93.1)	21 (87.5)	

Figure 2. Weekly COVID-19 admissions in the Madrid region versus Bell´s palsy cases treated in the emergency department.



in February 2019. Surprisingly, there were no differences in the duration of symptoms of FNP before ED presentation. Parents did not delay seeking medical attention in the ED due to fear of contracting the virus in hospital facilities.

As COVID-19 cannot be linked to most of the cases seen in our ED, other explanations should be explored. Firstly, during six weeks of the pandemic (March 20th, 2020 - May 6th, 2020) pediatric areas of most hospitals in Madrid were focused on adult patients with COVID-19 and only two hospitals, including ours, remained open as referral hospitals for pediatric emergencies. Nevertheless, the increase in FNP cases occurred not only at the beginning of the pandemic but also in most of the other months analyzed. Secondly, primary-care services in Spain are under-resourced, making them unable to meet care needs, and caregivers have struggled to schedule appointments during the main waves of the pandemic, which may have increased the number of FNP cases treated in hospital facilities rather than primary care. As evidenced by our series, 87.9% of the Bell's palsy patients were seen primarily in the ED during the pandemic, as compared to 63.1% in the previous three years. Thirdly, although lockdown orders, physical distancing, mask-wearing, and other non-pharmaceutical interventions have decreased the impact of many infectious diseases, the presence of other viruses related to FNP has not been ruled out in most cases.

In conclusion, a substantial increase of FNP among children and adolescents has been observed in hospital facilities during the first year of the pandemic, although microbiologic testing does not confirm a direct link with SARS-CoV-2 infection in most cases. The characteristics of FNP have not changed compared to previous years.

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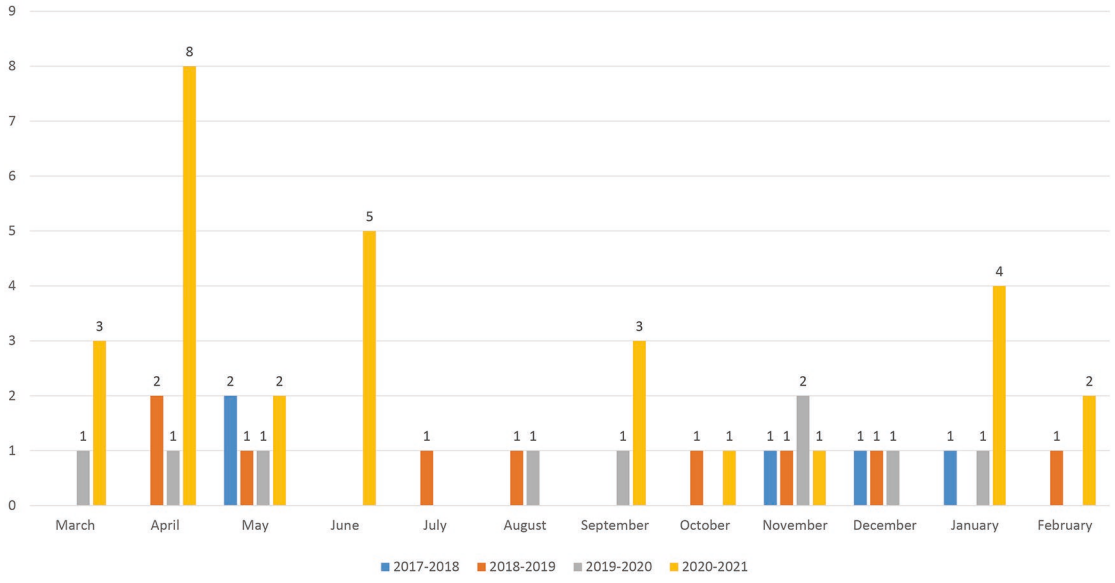
Figure 3. Monthly cases of idiopathic peripheral facial nerve palsy treated in the emergency department.



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Parálisis facial periférica en población pediátrica durante la pandemia de la COVID-19

Objetivos. Durante la pandemia de la COVID-19 se ha descrito una mayor frecuencia de parálisis facial periférica en adultos y niños. La etiología no está clara, ya que la mayoría de los casos ocurrió en pacientes negativos en las pruebas microbiológicas para confirmar infección por el SARS-CoV-2.

Pacientes y métodos. Es un estudio retrospectivo de casos pediátricos de parálisis facial periférica atendidos el primer año de la pandemia en el servicio de urgencias de un hospital pediátrico ubicado en una de las zonas con mayor prevalencia de COVID-19 en España. Los casos de este período se comparan con los casos de los tres años anteriores.

Resultados. Se incluyó a 29 pacientes. En los tres años anteriores, 24 pacientes presentaron la misma enfermedad, lo que supone que los casos se triplicaron. No se encontraron diferencias entre períodos, salvo que menos pacientes recibieron corticoides durante la pandemia (13,8 frente a 41,6%; p = 0,022). Catorce niños se sometieron a pruebas microbiológicas para detectar infección activa por el SARS-CoV-2 (12 reacciones en cadena de la polimerasa y dos test rápidos de antígenos), y todas fueron negativas. En 13 pacientes se realizó serología, y dos presentaron inmunoglobulina G positiva (15,3%).

Conclusión. Se observó un aumento significativo de los casos de parálisis facial periférica en niños y adolescentes durante el primer año de la pandemia, aunque las pruebas microbiológicas no pueden confirmar un vínculo directo con la infección por el SARS-CoV-2 en la mayoría de los casos. Las características de los pacientes no cambiaron entre los dos períodos. La dificultad para acceder a los centros de atención primaria durante la pandemia pudo influir en este aumento.

Palabras clave. COVID-19. Medicina de urgencias. Neurología pediátrica. Parálisis de Bell. Parálisis facial periférica. SARS-CoV-2.